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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/077,258

02/14/2002

Brian Sze-Ki Mo

018865-001010US

5261

20350

7590

10/04/2002

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EXAMINER

HUYNH, YENNHU B

ART UNIT

PAPER NUMBER

2813

DATE MAILED: 10/04/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/077,258

Applicant(s)

MO ET AL.

Examiner

Yennhu B Huynh

Art Unit

2813

-- The MAILING DATE of this communication appears on the cover sheet with the corresponding address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 14 February 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 9-14 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 9-14 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 3.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Claims 1-8 have been cancelled by Amendment filed on 2/14/02.

Claim Objections

Claim 13 is objected to because of the following informalities: line 1, --the method of claim 11-- should be changed to --the method of claim 10--. Appropriate correction is required.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 9-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fujii et al. (U.S. 4,774,556) in view of Mori (JP 63288047) and Kao et al. (IEEE, Vol.ED-34, 5/1987).

Fujii et al. disclose:

-Re. Claims 9 & 14(a,b): forming a trench 35 in silicon substrate 1 (fig.6), and heating the substrate up to 1,050 C degrees to form a layer of SiO₂ 44 inside the trench (fig.15,col.6, lines 9-59).

not => ?
SiO₂

Fig. 7

Layer 50 + 42

-Re. Claim 10: forming a silicon nitride layer 5 on the layer of SiO₂, and forming a second oxide layer 42 on the silicon nitride layer (col.9, lines 65-66).

-Re. Claims 12 & 14©: wherein the silicon nitride layer is formed by a CVD (Col.9, lines 44-46).

However, Fujii et al. do not disclose a silicon oxide is 100 angstroms thick (cl.9 (b)), a silicon nitride is 120 angstroms thick (cl.11) and of oxide layer is 50 angstroms thick (cl.13 & 14 (c))

Mori, in related art, disclose:

-Re. Claim 9 (b), 11 and 14 (b)): the layers SiO and Si₃N₄ are formed in a thickness such as 100 - 120 angstroms.

Kao, in related art, disclose:

-Re. Claims 13 & 14 (d): the oxide thickness is varies and depend on other parameters (p.25-37)

It would have been obvious to one having ordinary skill in the art at the time the invention was made to combine the teaching from Mori and Kao 's process in forming a gate dielectric layer with the appropriated oxide, silicon oxide and silicon nitride thickness, to obtain more uniform thickness oxide, in order to reduce leakage current and higher gate voltage, into Fujii et al.'s process at a high temperature of 1,100 C degrees for oxide growing. This modification would complete the method of forming a trench transistor having a superior gate dielectric as claimed invention.

Conclusion

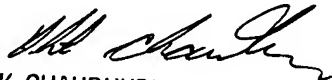
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Yennhu B. Huynh whose telephone number is 703-308-6110. The examiner can normally be reached on M-F 8.30AM-7.00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri, can be reached 703-306-2794. The fax phone numbers for the organization where this application or proceeding is assigned are 703-308-7722 for regular communications and 703-308-7724 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

YNBH,

9/25/02


OLIK CHAUDHURI
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800